

# SALMONELLOSIS

## DISEASE REPORTING

### *In Washington*

DOH receives approximately 650 to 800 reports of salmonellosis per year, for an average rate of 12.5/100,000 persons, and an average of 1 associated death reported each year.

Frequently named sources in Washington include poultry products, pets (reptiles, exotic animals, cattle), raw milk and milk products, fruits and vegetables.

### *Purpose of reporting and surveillance*

- To identify sources transmission (e.g., a commercial product or foodhandler) and to prevent further transmission.
- When the source is a risk for only to a few individuals (e.g., an animal or private meal), to inform those individuals how they can reduce their risk of exposure.
- To identify cases that may be a source of infection for others (e.g., a food handler), and prevent further disease transmission.
- To educate potentially exposed persons about the signs and symptoms of disease to facilitate early diagnosis.

### *Reporting requirements*

- Health care providers: **immediately notifiable to Local Health Jurisdiction**
- Hospitals: **immediately notifiable to Local Health Jurisdiction**
- Laboratories: notifiable to Local Health Jurisdiction within 2 workdays; specimen submission required
- Local health jurisdictions: notifiable to DOH Communicable Disease Epidemiology within 7 days of case investigation completion or summary information required within 21 days

## CASE DEFINITION FOR SURVEILLANCE

### *Clinical criteria for diagnosis*

An illness of variable severity commonly manifested by diarrhea, abdominal pain, nausea, and sometimes vomiting. Asymptomatic infections may occur and the organism may cause extraintestinal infections.

**Laboratory criteria for diagnosis**

- Isolation of *Salmonella* from a clinical specimen.

**Case definition**

- Probable: a clinically compatible case that is epidemiologically linked to a confirmed case.
  - Confirmed: a case that is laboratory confirmed.
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**A. DESCRIPTION****1. Identification**

A bacterial disease commonly manifested by an acute enterocolitis, with sudden onset of headache, abdominal pain, diarrhea, nausea and sometimes vomiting. Dehydration, especially among infants or in the elderly, may be severe. Fever is almost always present. Anorexia and diarrhea often persist for several days. Infection may begin as acute enterocolitis and develop into septicemia or focal infection. Occasionally, the infectious agent may localize in any tissue of the body, produce abscesses and cause septic arthritis, cholecystitis, endocarditis, meningitis, pericarditis, pneumonia, pyoderma or pyelonephritis. Deaths are uncommon, except in the very young, the very old, the debilitated and the immunosuppressed. However, morbidity and associated costs of salmonellosis may be high.

In cases of septicemia, *Salmonella* may be isolated on enteric media from feces and blood during the acute stages of illness. In cases of enterocolitis, fecal excretion usually persists for several days or weeks beyond the acute phase of illness; administration of antibiotics may not decrease the time that organisms are excreted. For detection of asymptomatic infections, 3-10 g of fecal material is preferred to rectal swabs and should be inoculated first into an appropriate enrichment medium; specimens should be collected over several days since excretion of the organisms may be intermittent. Serologic tests are not useful in diagnosis.

**2. Infectious Agent**

A new nomenclature for *Salmonella* has been proposed based on DNA relatedness. According to the proposed nomenclature, only two species would be recognized-*Salmonella bongori* and *Salmonella enterica* (both genus and species italicized). All human pathogens would be regarded as serovars within subspecies I of *S. enterica*. The proposed nomenclature would change *S. typhi* to *S. enterica* serovar Typhi, abbreviated *S. Typhi* (note that Typhi is not italicized and a capital letter is used). Some official agencies have adopted the new nomenclature although it had not been officially approved as of mid-1999. This new nomenclature is used in this chapter.

Numerous serotypes of *Salmonella* are pathogenic for both animals and people (strains of human origin that cause typhoid and paratyphoid fevers are presented in a separate chapter). There is much variation in the relative prevalence of the different serotypes from country to country; in most countries that maintain *Salmonella* surveillance, *Salmonella enterica* serovar Typhimurium (*S. Typhimurium*) and *Salmonella enterica* serovar Enteritidis (*S. Enteritidis*) are the two most commonly reported. Of more than 2,000 known serotypes, only about 200 are detected in the US in any given year. In most areas, a small number of serotypes account for the majority of confirmed cases.

### **3. Worldwide Occurrence**

Worldwide; more extensively reported in North America and Europe due to better reporting systems in these regions. Salmonellosis is classified as a foodborne disease because contaminated food, mainly of animal origin, is the predominant mode of transmission. Only a small proportion of cases are recognized clinically, and in industrialized countries as few as 1% of clinical cases are estimated to be reported. The incidence rate of infection is highest in infants and young children. Epidemiologically, *Salmonella* gastroenteritis may occur in small outbreaks in the general population. About 60%-80% of all cases occur sporadically; however, large outbreaks in hospitals, institutions for children, restaurants and nursing homes are not uncommon and usually arise from food contaminated at its source, or less often, during handling by an ill person or a carrier, but person to person spread can occur. It is estimated that about 5 million cases of salmonellosis occur annually in the US. An epidemic in the US that involved 25,000 cases resulted from a nonchlorinated municipal water supply; the largest single epidemic due to improperly pasteurized milk affected 285,000 persons.

### **4. Reservoir**

A wide range of domestic and wild animals, including poultry, swine, cattle, rodents and pets such as iguanas, tortoises, turtles, terrapins, chicks, dogs and cats; also humans, i.e., patients, convalescent carriers and, especially, mild and unrecognized cases. Chronic carriers are rare in humans but prevalent in animals and birds.

### **5. Mode of Transmission**

By ingestion of the organisms in food derived from infected animals or contaminated by feces of an infected animal or person. This includes raw and undercooked (inadequate time for a given temperature) eggs and egg products, raw milk and raw milk products, contaminated water, meat and meat products, poultry and poultry products. In addition, pet turtles, iguanas and chicks, and unsterilized pharmaceuticals of animal origin are potential sources of these bacteria. Recently, several outbreaks of salmonellosis have been traced to consumption of raw fruits and vegetables that were contaminated during slicing. Infection is transmitted to farm animals by feeds and fertilizers prepared from contaminated meat scraps, tankage, fish meal and bones; the infection spreads by bacterial multiplication during rearing and slaughter. Fecal-oral transmission from person to person is important, especially when diarrhea is present; infants and stool incontinent adults pose a greater risk

of transmission than do asymptomatic carriers. With several serotypes, only a few organisms ingested in vehicles that buffer gastric acid can cause infection, but usually  $>10^{2-3}$  organisms are required.

Epidemics are usually traced to foods such as processed meat products, inadequately cooked poultry and poultry products; uncooked or lightly cooked foods containing eggs and egg products, raw milk and dairy products, including dried milk; and foods contaminated with feces by an infected food handler. Epidemics may also be traced to foods such as meat and poultry products that have been processed or prepared with contaminated utensils or on work surfaces or tables contaminated in previous use. *S. Enteritidis* infection of chickens and eggs has caused outbreaks and single cases, especially in the northeastern US and Europe, and is responsible for the majority of cases of this serotype in the US. The organisms can multiply in a variety of foods, especially milk, to attain a very high infective dose; temperature abuse of food during its preparation and cross contamination during food handling are the most important risk factors. Hospital epidemics tend to be protracted, with organisms persisting in the environment; these epidemics often start with contaminated food and continue through person to person transmission via the hands of personnel or contaminated instruments. Maternity units with infected (at times asymptomatic) infants are sources of further spread. Fecal contamination of nonchlorinated public water supplies has caused some extensive outbreaks. In recent years, geographically widespread outbreaks due to ingestion of tomatoes or melons from single suppliers have been recognized.

## **6. Incubation period**

From 6 to 72 hours, usually about 12-36 hours.

## **7. Period of communicability**

Throughout the course of infection; extremely variable, usually several days to several weeks. A temporary carrier state occasionally continues for months, especially in infants. Depending on the serotypes, approximately 1% of infected adults and 5% of children aged <5 years may excrete the organism for >1 year.

## **8. Susceptibility and resistance**

Susceptibility is general and is usually increased by achlorhydria, antacid therapy, GI surgery, prior or current broad-spectrum antibiotic therapy, neoplastic disease, immunosuppressive therapy and other debilitating conditions including malnutrition. Severity of the disease is related to the serotype, the number of organisms ingested and host factors. HIV infected persons are at risk for recurrent nontyphoidal *Salmonella* septicemia. Septicemia in people with sickle cell disease increases the risk of focal systemic infection, e.g., osteomyelitis.

## B. METHODS OF CONTROL

### 1. **Preventive measures:**

- a. Educate food handlers and preparers about the importance of a) hand-washing before, during and after food preparation; b) refrigerating prepared foods in small containers; c) thoroughly cooking all foodstuffs derived from animal sources, particularly poultry, pork, egg products and meat dishes; d) avoiding recontamination within the kitchen after cooking is completed; and e) maintaining a sanitary kitchen and protecting prepared foods against rodent and insect contamination.
- b. Educate the public to avoid consuming raw or incompletely cooked eggs, as in eggs cooked over easy or sunny side up, in egg-nogs or homemade ice cream, and using dirty or cracked eggs.
- c. Pasteurized or irradiated egg products should be used to prepare dishes in which eggs would otherwise be pooled before cooking or when the dish containing eggs is not subsequently cooked.
- d. Exclude individuals with diarrhea from food handling and from care of hospitalized patients, the elderly and children.
- e. Indoctrinate known carriers on the need for very careful handwashing after defecating (and before handling food) and discourage them from handling food for others as long as they shed organisms.
- f. Recognize the risk of *Salmonella* infections in pets. Chicks, ducklings and turtles are particularly dangerous pets for small children.
- g. Establish the facilities and encourage the use of food irradiation for meats and eggs.
- h. Inspect for sanitation and adequately supervise abattoirs, food processing plants, feed blending mills, egg grading stations and butcher shops.
- i. Establish *Salmonella* control programs (feed control, cleaning and disinfection, vector control and other sanitary and hygienic measures).
- j. Adequately cook or heat treat (including pasteurization or irradiation) animal derived foods prepared for animal consumption (meat meal, bone meal, fish meal, pet food) to eliminate pathogens; follow by measures to avoid recontamination.

### 2. **Control of patient, contacts and the immediate environment:**

- a. Report to local health authority.
- b. Isolation: For hospitalized patients, enteric precautions in handling feces and contaminated clothing and bed linen. Exclude symptomatic individuals from food handling and from direct care of infants, elderly, immunocompromised and institutionalized patients. Exclusion of asymptomatic infected individuals is indicated for those with questionable hygienic habits and may be required by local or state regulations. When exclusion is mandated, release to return to work handling food or in patient care generally requires 2 consecutive negative stool cultures for *Salmonella* collected not less than 24 hours apart; if antibiotics have been given, the initial culture should be taken at least 48 hours after the last dose. Proper handwashing should be stressed.

- c. Concurrent disinfection: Of feces and articles soiled therewith. In communities with a modern and adequate sewage disposal system, feces can be discharged directly into sewers without preliminary disinfection. Terminal cleaning.
- d. Quarantine: None.
- e. Immunization of contacts: No immunization available.
- f. Investigation of contacts and source of infection: Culture stools of any household contacts who are involved in food handling, direct patient care, or care of young children or elderly people in institutional settings.
- g. Specific treatment: For uncomplicated enterocolitis, none generally indicated except rehydration and electrolyte replacement with oral rehydration solution (see CHOLERA, B2g). Antibiotics may not eliminate the carrier state and may lead to resistant strains or more severe infections. However, infants under 2 months of age, the elderly, the debilitated, those with sickle cell disease, persons infected with HIV, or patients with continued or high fever or manifestations of extraintestinal infection, should be given antibiotic therapy. Antimicrobial resistance of nontyphoidal salmonellae is variable; in adults, ciprofloxacin is highly effective but its use is not approved for children; ampicillin or amoxicillin may also be used. TMP-SMX and chloramphenicol are alternatives when antimicrobial resistant strains are involved. Patients infected with HIV may require life-long therapy to prevent *Salmonella* septicemia.

### **3. Epidemic measures**

See Diseases of suspected foodborne origins, STAPHYLOCOCCAL FOOD INTOXICATION, B3a and B3b. Search for a history of food handling errors, such as use of unsafe raw ingredients, inadequate cooking, time-temperature abuses and cross contamination. In the US, in *S. Enteritidis* outbreaks in which dishes containing eggs are implicated, initiate trace back to the egg source; report to the US Department of Agriculture is advised.

### **4. International measures**

WHO Collaborating Centres.